What is claimed is:

1. A photodetector structure based on a silicon-on-insulator (SOI) platform, the structure comprising:

a silicon substrate including a top major surface;

a buried oxide layer disposed to cover the top major surface of said silicon substrate, said buried oxide layer including a top major surface;

a sub-micron thickness silicon optical waveguide layer disposed to cover at least a portion of the buried oxide layer top major surface;

a poly-germanium detector layer disposed to contact a portion of the silicon optical waveguide layer; and

a pair of electrical contacts disposed on opposing lateral terminals of the poly-germanium detector layer, wherein said poly-germanium detector layer exhibits a band gap suitable for absorbing an optical signal propagating along the sub-micron thickness silicon optical waveguide layer and generating an electrical output signal between the pair of electrical contacts.

2. A photodetector structure as defined in claim 1 wherein the structure further comprises a dielectric layer disposed between the sub-micron thickness silicon optical waveguide layer and the poly-germanium detector layer.

3. A photodetector structure as defined in claim 2 where the dielectric layer comprises a grown SiO_2 layer.

4. A photodetector structure as defined in claim 1 wherein the sub-micron thickness silicon optical waveguide layer comprises a slab geometry, with the poly-germanium detector layer disposed to cover a top major surface portion of said slab waveguide layer.

5. A photodetector structure as defined in claim 1 wherein the sub-micron thickness silicon optical waveguide layer comprises a strip geometry, with the poly-germanium detector layer disposed to conformally coat a portion of the top major surface of the buried oxide layer, as well as the side and top surfaces of the silicon strip waveguide layer.

6. A photodetector structure as defined in claim 5 where the pair of electrical contacts are disposed on those portions of the poly-germanium layer in direct contact with the underlying buried oxide layer.

7. A photodetector structure as defined in claim 6 wherein the structure further comprises a dielectric layer disposed between the sub-micron silicon optical strip waveguide layer and the poly-germanium layer.

8. A photodetector structure as defined in claim 6 wherein the silicon strip waveguide comprises a rectangular geometry.

9. A photodetector structure as defined in claim 6 wherein the silicon strip waveguide comprises a geometry including elements such as Y-splitters, ring resonators and/or coupled waveguides.

10. A photodetector structure as defined in claim 6 wherein the poly-germanium detector layer is disposed at an end termination of the silicon strip waveguide layer so as to overly a portion of the top surface of the buried oxide layer.

11. A photodetector structure as defined in claim 1 wherein the sub-micron thickness silicon optical waveguide layer comprises a slab layer, with a poly-silicon rib waveguide disposed to cover a portion of the top major surface of said slab and the poly-germanium detector layer disposed to conformally coat a portion of the top major surface of the rib waveguide layer, as well as the side and top surfaces of the silicon rib waveguide layer.

12. A photodetector structure as defined in claim 11 wherein a dielectric electrical insulating layer is disposed between the silicon slab waveguide layer and the poly-silicon rib waveguide layer.

13. A photodetector structure as defined in claim 11 wherein the poly-silicon rib waveguide comprises a geometry including elements such as Y-splitters, ring resonators and/or coupled waveguides.

14. A photodetector structure as defined in claim 1 wherein the sub-micron thickness silicon optical waveguide layer comprises a silicon strip layer, with a poly-silicon rib waveguide disposed to cover a portion of the top major surface of said strip and the poly-germanium detector layer disposed to conformally coat a portion of the top

major surface of the strip waveguide layer, as well as the side and top surfaces of the silicon strip waveguide layer.

15. A photodetector structure as defined in claim 14 wherein the poly-germanium detector layer is disposed at an end termination of both the silicon strip waveguide layer and the poly-silicon rib waveguide layer.

16. A photodetector structure as defined in claim 14 wherein the poly-germanium detector layer is disposed to conformally coat a portion of the top major surface of the silicon strip waveguide layer, as well as the side and top surfaces of the silicon strip waveguide layer at the end termination of the poly-silicon rib waveguide layer.

17. A photodetector structure as defined in claim 14 wherein the sub-micron thickness silicon optical waveguide layer comprises a poly-silicon strip waveguide layer, with a poly-silicon rib waveguide layer disposed to cover a portion of the top major surface of the poly-silicon strip waveguide layer.

18. A photodetector structure as defined in claim 17 wherein the poly-germanium detector layer is disposed at an end termination of both the poly-silicon strip waveguide layer and the poly-silicon rib waveguide layer.

19. A photodetector structure as defined in claim 18 wherein the poly-germanium detector layer is disposed to conformally coat a portion of the top major surface of the poly-silicon strip waveguide layer, as well as the side and top surfaces of the silicon strip waveguide layer at an end termination of the poly-silicon rib waveguide layer.

20. A photodetector structure as defined in claim 1 wherein the poly-germanium detector layer includes lateral regions of p-type and n-type doping to form a PN junction in the detector.

21. A photodetector structure as defined in claim 1 wherein the poly-germanium detector layer includes lateral, separated regions of p-type and n-type doping to form a PIN structure photodetector.